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THE SCIENCE NEWS-LETTER

A Weekly Summary of Current Science

EDITED BY WATSON DAVIS

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Vol. IX, No. 283 Saturday, September 11, 1926

SCIENCE IN DAILY LIFE

By Dr. Edwin E. Slosson
Director, Science Service, Washington, D.C.

The American Library Association has asked me to write something about the importance of the physical sciences for one of their forthcoming pamphelts on "Reading With A Purpose". This is what I said:

Ignorance of the laws of nature excuses no one. We have to live in accordance with them if we are to live at all, and the more we know of them the better we can live. The unprecedented expansion of civilization in the last two centuries, the immense increase in wealth and the general diffusion of the comforts and conveniences of life, must be credited chiefly to applied science, and especially to the physical sciences, since the biological, psychological and social sciences have not yet developed to a point where they exert so powerful an influence upon mankind.

It is interesting and important to learn about things far away and long ago, such for instance as the habits of the auks of the Arctic or life in Egypt in the time of the Pharoah Tut-Ankh-Amen, but after all we can live, and even be happy, in complete ignorance of these things. But we cannot carry on our work for a day without making some use of the laws of the physical sciences whether we are conscious of them or not.

Fortunately we are forced to learn a lot about them in our infancy, long before we go to school. It is pounded into our brains by hard knocks. We have to acquire a practical knowledge ofthe law of gravitation in childhood before we are able to walk, and we learn a good deal about chemistry by the experimental method of putting everything into our mouths and so testing it by taste and smell, which are the two senses that distinguish substances by their chemical constitution.

So every grown person, though he may never have been to school, gains through his daily life and occupation a considerable knowledge of the physical sciences. He gets, for instance, a certain familiarity with the physical principles of machinery and with the chemical properties of metals and foods. But the knowledge so accidentally acquired is fragmentary and often fallacious. The information that he has so picked up is not connected, and he cannot apply it to new problems. Such a man knows more than he knows he knows, but he is not able to make full use of it because he has never connected his facts or generalized his ideas. In short, such a casual collection of fragmentary facts is not science, but merely the raw material for science. What such a man needs is to read some simple systematic work on the physical sciences,

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So every grown person, though he may never have gone to school, gains through his daily life and occupation a considerable knowledge of the physical sciences. He gets, for instance, a certain familiarity with the physical principles of machinery and with the chemical properties of metals and foods. But the knowledge so incidentally acquired is fragmentary and often fallacious. The information that he has picked up is not connected, and he cannot apply it to new problems. Such a man knows more than he knows he knows, but he is not able to make full use of it because he has never connected his facts or generalized his ideas. In short, such a mixed collection of fragmentary facts is not science, but merely the raw material for science. What such a man needs is to read some simple systematic work on the physical sciences, and he will then find that the practical points he has picked up will fall into their proper places in the general laws, and that these laws will extend his vision and throw new light on all that he sees and does ever after. To study physics and chemistry is like giving sight to a blind man. It opens to him a new world of undreamed-of-beauty, meaning and possibilities.

But simply because these physical sciences are so fundamental and essential they are apt to be overlooked and neglected in the acquirement of culture. When tourists visit a Gothic cathedral many of them see nothing but the frescoes and gargoyles, and give no thought to the architectural principles of its structure, yet the esthetic effect of the edifice is due largely to the way the structural principles are revealed in its pillars, buttresses and arches. One who fails to get that misses, not only the meaning, but much of the beauty of the building. So, too, one who, for lack of acquaintance with the physical sciences, does not see the inner meaning of the acts and processes of daily life, not only is hampered in their control, but loses the enjoyment of their significance.

CHEMISTS BELIEVE FUTURE FUEL PROBLEMS CAN BE MET

When there is one motor car to every four persons in the United States, which is now estimated as the saturation point in motor-mad America, and oil wells stop producing, what will America do for "gas". This problem wrinkled the brows of scientists gathered in Philadelphia for the seventy-second meeting of the American Chemical Society, and many schemes were suggested for keeping the wolf from the garage door.

"The United States had 100,000 motor cars twenty years ago, and today she has nearly 20,000,000," Dr. A. C. Fieldner, chief chemist of the Pittsburgh department of the U. S. Bureau of Mines explained. "The United States owns five sixths of all the motor cars and trucks in the world, anduses 80 per cent. of all the motor fuel. Nearly all of this motor fuel is gasoline made from petroleum, and the petroleum supply in the United States is definitely limited."

The engines of motor cars, Dr. Fieldner said, are very inefficient users of fuel. The mileage could be almost doubled if engines of greater gas compression were used with anti-knock gasoline, and the supply of petroleum could be made to last some years longer.

The oil wells of proven acreage in the United States are estimated to contain a billion barrels of readily available petroleum, and this supply would last only until 1936, Dr. Fieldner explained, at the present rate of consumption by inefficient engines. It is believed that more than five times as much oil or about 26 billion barrels may still be gotten out of the wells when ordinary pumping is finished. In addition to this, oil shale deposits, soft coal and lignite can supply about 700 billion barrels more when needed, according to the estimates of experts. This would make a total oil reserve of 734 billion barrles, which sounds enormous, but only about 4 per cent. of it comes from crude oil which is readily available and from which all the gasoline of commerce is made.

Gasoline used to be distilled from crude oil, but as the demand leaped with the growth of the motor car other means were used to swell the amount. A process called

"cracking" was resorted to and in 1925 petroleum yielded 35 per cent. gasoline. This is a high mark, but it is expected to be far surpassed in the future. An increase to a 55 per cent. yield, Dr. Fieldner said, would stretch the 5 billion barrels.enough to make them last until 1943 instead of 1936.

The potential gasoline source of the future lies in cracking heavy oils into just two products, gasoline and coke, in one operation, according to Dr. Gustave Egloff of Chicago. Instead of a 35 per cent. yield in ten years it will be economically necessary to get 75 per cent., he believes.

Not only does the cracking process increase the ~~gasoline~~ yield of crude oil but it also provides the gasoline with the sought-for anti-knock quality. This is because of the high per centage of certain kinds of unsaturated carbohydrates called olefines that are found in it. Formerly, gasoline consisting of saturated compounds was in great demand and sold at a premium, but now it is doctored with anti-knock substances or blended with cracked gasoline before sold.

The amount of cracked gasoline is continually increasing and can be used with motors of higher compressibility than ordinary gasoline, and a greater milage can be obtained. The present average compressibility of all engine models in the United States is a little more than 4 to 1, but the best anti-knock cracked gasoline is suitable for a 5½ to 1 compressibility. Dr. Fieldner believes that the automobile manufacturers will gradually modify theengines as the character of the gasoline changes, and the resulting efficiency will save fuel and make the supply last the longer. It will increase the pleasure of the motorist by the smoothness and noiselessness of the motor and save him money as well.

When it becomes necessary, Dr. Fieldner said, the gasoline supply will be augmented by alcohol from the fermentation of vegetable matter as well as from its synthesis from coal and oil gases. Ultimately, however, oil shale, soft coal and lignite must become the source of automotive fuels. Oil distilled from shale will be cracked into gasoline and other products, while coal and lignite will be carbonized into solid and liquid fuels and other by-products. New liquid combustible materials, other than alcohol, may be synthesized from combustible coal gases.

Recovery of oil shale in the United States would yield billions of barrels of oil. This oil when cracked would yield the highest grade anti-knock gasoline which would be greatly superior to that from tar oils from coal because it would be free from objectionable acids.

Motor fuels from coal may be obtained in a variety of ways in the future. At Mannhein in Germany coal and lignite are completely gasified, and methanol, synthol and other liquid combustibles are synthesized from it. In France ethyl alcohol is made from coal gas. Ethylene, a by-product of the coke ovens, is converted into alcohol by the sulphuric acid method. If this method were applied in the United States the increase of motor fuel yields from coke plants could be pushed up to 55 per cent. Ethylene from cracking stills and from oil shale plants could also be made into alcohol.

If liquid fuel becomes very scarce in spite of the efforts of scientists the electric storage battery may come back into use as motive power, especially if the long delayed discovery of a light weight battery is made. Another possibility is

that the use of a coal dust motor may come into vogue. Experimental work is being conducted with some success by German manufacturers on the Diesel engine using coal dust. In fact, Diesel's original idea was to use powdered coal fuel, and after all these years, this expedient may after all become a solution.

SYNTHETIC GERMAN PETROLEUM MAY SOLVE MOTOR FUEL PROBLEM

A new method of cheaper synthesis of a high grade motor fuel in Germany may go far toward the solution of the motor fuel problem in the future. The Berlin professor, Franz Fischer, who recently devised means of making liquid fuels synthetically from coal products, has now simplified his process so that he can dispense with costly high pressure apparatus that has stood in the way of its commercial development.

The new method produces a pleasant smelling gasoline as clear as water and one which will not harden or become gummy on exposure. The gasoline is highly volatile and is largely made up of unsaturated compounds like olefines which impart to the gasoline valuable anti-knock properties. This enables it to be used in efficient high compression motors without objectionable knocking and with great economy.

A number of valuable by-products may help to put the process on a sound commercial basis in the future. Certain substances of high boiling point condensing to heavier oils, may by the use of catalyzing agents be changed to hard paraffine. The purified crystallized substance could be used in the manufacture of candles and other paraffine products, it is claimed.

Semi-coke, a new industry by-product for which a commercial use has not yet been found, may be used as the basis of synthesis of this new gasoline. Semi-coke is left over in the low temperature carbonization of coal in the making of tar oils. In the Fischer process water gas from which the new liquid fuel is condensed can be made from coke or semi-coke, and the latter, it is claimed, would be an ideal starting material.

Coke and coal are almost completely gasified when steam is led over them at a high temperature, and water gas, a mixture of carbon monoxide and hydrogen, is formed. If this water gas could be entirely transformed into liquid motor fuel, the problem of the wasteless transformation of solid coal into liquid fuel, the dream of the modern chemists, would be accomplished.

The Badische Analin und Soda Fabrik first succeeded in commercially synthesizing liquid fuels from this gas mixture in Germany by means of Dr. Fischer's early method, in which pressures of 1500 pounds per square inch or more were employed. By his new process, however, Prof. Fischer has succeeded in synthesizing gaseous, liquid and solid carbohydrates from carbon monoxide and hydrogen at ordinary pressure. Hitherto all reduction of carbon monoxide without pressure yielded methane, but Fischer found that by using an ironzinc oxide catalyzer more complicated products were formed. Other metals and their compounds were studied and a cobalt chromium oxide mixture was found to stimulate the formation of gaseous, liquid and solid carbohydrates, when heated to about 518 degrees Fahrenheit.

The carbon of the carbon monoxide is said to be made into carbide by the metal,

and the carbide then split by the hydrogen in the gas mixture. As a result the metal is regenerated and carbohydrates are formed.

In the old Fischer method a large proportion of the synthetic products formed were highly oxidized, but in the new normal pressure process they are unoxidized. Prof. Fischer found that if the temperature was raised the formation of higher carbohydrates stopped and methane was again formed.

MONKEY HOUSE HAS ALL MODERN IMPROVEMENTS

A palatial concrete and glass establishment for monkeys that supplies every simian comfort possible in a chilly northern clime is a recent addition to the equipment of the Pasteur Institute.

Experimental work on the types of animals most nearly approaching man is a first requirement of nearly every piece of research that helps to find some new means of cutting down the toll of disease. Unfortunately monkeys transported from the tropics to an alien environment pick up so many intercurrent infections that precise and accurate medical work with them is exceedingly difficult.

The new building in the grounds of the Pasteur Institute was built under the direction of Dr. Albert Calmette, whose tuberculosis vaccine has attracted wide attention in medical circles, and is especially designed to overcome monkey susceptibilities to disease. Funds for its construction were donated by the Princess Marie of Greece in honor of her father, Prince Roland Bonaparte,himself a friend and patron of scientific endeavor.

Dr. Calmette has made a close study of simian needs and believes that if monkeys are to be kept alive in the midst of northern civilization their living condition should approximate as closely as possible their natural habitat. Peanuts and bananas are not the only things monkeys should have to eat, circuses and zoos notwithstanding, according to Dr. Calmette.

Two big blacks from central Africa where the Pasteur monkeys were collected, act as cook and valet dechambre. One burly African in the model kitchen at one end of the glass enclosed building prepares menus as well balanced as any self-respecting chimpanzee would steal for himself in the depths of the Kongo.

Each ape has a roomy chamber enclosed completely with glass or screen, as the weather requires, except for a small window in front. Radiators located midway up the wall keep the atmosphere at jungle temperature, while an elaborate ventilating system, running water and a system of perches and swings that would do credit to any playground help to make urban home life an attractive substitute for a precarious struggle for existence in central African wilds.

SCIENTIST MAKES JUICE IN WHICH CELLS WILL GROW

The process of cell multiplication, or growth, does not require the presence of a specific gland substance or hormone, declares Dr. Alexis Carrel, of the Rockefeller Institute, but only proper nutrient materials.

New light on how the nutrition of the body actually takes place is a potential result of research undertaken at the Rockefeller Institute for Medical Research by Dr. Carrel and Dr. Lillian E. Baker.

For fourteen years the famous medical scientist has kept growing in the laboratory colonies of a strain of tissue cells, which doubled their number every 48 hours as long as they were cultivated in a medium of blood plasma and embryonic tissue juice. The liquid which furnishes nourishment for the growth of an embryo seemed to be the only substance that would foster the unlimited increase of cell division, since all attempts to get the cells to grow in any artificially prepared solutions failed.

The investigators at length observed that the material in the embryonic juice that was chiefly used by the growing cells was the protein element it contained. Accordingly they attempted to prepare a protein product that could be substituted for it. Success attended their efforts, and they have now found that cells will increase and multiply merrily at their normal rate in a medium composed of the class of proteins known as proteoses, which correspond roughly to protein material that is part way through the process of digestion.

Drs. Carrel and Baker state that at last the actual chemical nature of the protein substance used by tissue cells in theprocess of multiplication has been discovered.

DAILY PINT OF MILK DOUBLES BOYS' YEARLY GAIN IN WEIGHT

Milk for growing boys and girls is a universal slogan but actual experiments to prove its value have produced figures that astound even the medical authorities.

Dr. H. C. C. Mann has reported to the British Medical Research Council the results of one of the most extensive nutritional experiments ever undertaken that lasted four years and involved over 500 boys. This investigation has demonstrated that the addition of a pint of milk a day to a diet that satisfied even a growing boy's appetite brought up the yearly average gain in weight from 3.85 pounds to 6.98 pounds and increased the gain in height from 1.84 to 2.63 inches.

The boys used as subjects for the experiment, mostly foundlings who had previously been examined to exclude the possibility of disease, were housed in cottages in a suburb outside of the city. Living conditions and discipline were excellent, according to Dr. Mann, while short vacations and absences assured almost continuous observation throughout the whole period.

The boys were divided into different groups, one of which received only the basal diet that was planned to meet the demands of the child of school age. This

dormitory fare was judged by physicians to be equal and even slightly better than that customary in working class homes, while periodic physical examination of the boys in this group showed them to be in good physical condition.

To find out what classes of food would produce the most increase in height and weight, other groups were each given extra rations of sugar, fresh butter with a high vitamin content, fresh cow's milk, vitamin deficient margarine and concentrated protein equal in food value to the meat in the regular diet.

The milk and butter groups were found to make the largest gains, the boys who had the pint of milk being way in the lead with an average gain of nearly seven pounds a year and over two and a half inches in height. Casual visitors easily picked them out as "being obviously more fit than the others ". The whole group enjoyed exemption from illness, Dr. Mann stated, when sickness in the other houses was more prevalent than usual.

LIGHT ALLOYS MAY BE METALS OF FUTURE

America leads the world in thepractical development of light tough alloys for structural purposes, Francis C. Frary of New Kensington, Pa., told the American Chemical Society. There are only two light metals, aluminum and magnesium, which seem to face an increasing demand in the future, Mr. Frary said. Other light metals are chiefly used as chemical reagents, but not for alloys.

Magnesium-rich alloys are being perfected and their use in aviation and other fields where lightness is the main consideration and cost relatively unimportant, is increasing. Aluminum alloys on the other hand are competing with brass and steel, especially in the transportation field. Sheet, castings, forgings, and structural shapes made of these alloys, have the strength of mild steel and only one-third its weight, Mr. Frary said, and their use will rapidly increase.

COTTON FROM WOOD IS HOPE OF CHEMISTS

The boll weevil, the bane of southern planters and northern congressmen alike, will be out of a job andhave no place to go if the efforts of scientists to make a soft downy cotton from hard fibers of wood are attended by success in the future. Gustavus J. Esselen of Boston told the recent meeting of the American Chemical Society of the efforts of chemists in their search for new sources of cellulose raw materials and of the possibility of obtaining from wood a cellulose similar to that of cotton. Untold possibilities in the future development of the textile trade may result, Mr. Esselen said, from the application of cellulose chemistry to the industry.

COLORED MOVIES HURT EYES LESS THAN BLACK AND WHITE ONES

People who have had to miss the movies because they hurt their eyes may go in perfect comfort and ease to the colored ones that are being developed today. Prof. Leonard T. Troland of the psychology department of Harvard University has made a study of both kinds of movies and gives the colored ones a clean bill of health.

"Some persons still insist that motion pictures hurt their eyes in spite of the fact that the vivid black andwhite contrasts of the early motion picture and the unsteadiness on the screen and the flickering projection have now been eliminated," Prof. Troland said. "Experience has shown, however, that eye strain is much less for the average sensitive observer after seeing a colored picture.

"The more natural a picture is, it seems, the easier it is for the oculo-motor system to make the images'appear as they should'," Dr. Troland explained. "In black and white pictures violent contrasts often have to be used in order to get the effect of depth and reality, and such contrasts tire the eyes. Colors on the other hand express contrasts in a harmless way and also improve the truthfulness of the pictures."

When motion pictures in color were first introduced about fifteen years ago annoying fringes of red and green on the edges of moving objects disturbed the enjoyment of the pictures and critics said that they were much worse for the eyes than the black andwhite performances. The trouble was that the red and green components were not photographed simultaneously and the effect was a doubling of the image on the screen which the eye muscles struggled to make into one again. This upset the normal balance of what Prof. Troland calls the ocular reflexes.

The fringing and double image defects in natural color movies have been overcome in recent years, and the modern pictures are quite free from them. Prof. Troland says that sensitive people feel so much less strain now from the colored pictures that they often close their eyes entirely to the black and white portion of the films.

CORN BORER HARVESTER FIGHTS PEST IN OHIO

Machinery specially adapted to fight the European corn borer is being shipped into the territory infested with the corn plague. The harvesters are designed with low cutting blades that slice off the stubble very close to the surface of the ground. This leaves as many as possible of the borers in the stalk to be crushed during the husking process.

The low cutting has an additional advantage in reducing the numbers of next year's crop of corn borers, since the pest migrates to the base of the stalk as the corn ripens and spends the winter in the stubble that is left in the fields.

Machinery promises more success than any other means tried so far in killing the borer while actually at work, according to Prof. G. W. McCuen of the department of agricultural engineering at Ohio State University.

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GERMANS MAKE WOOL FROM PINE NEEDLES

Chemically treated pine needles have worked out as a substitute for wool for certain purposes very successfully. By varying the process a wooly product is obtained that comes either in the shape of fine sheet wadding or in soft fleeces that are used to stuff mattresses. The pine wool has fine, strong fibers not unlike hemp, and finds its best use when woven into heavy materials such as carpets and horse blankets.

The new process has a valuable asset in one of its by-products that results from the chemical treatment necessary to remove the resin from the needles. The sticky residue is shaped into resinous briquettes which have a very high fuel value and which have found a ready use in the manufacture of artificial illuminating gas.

CHARACTER READING BY FACE ALL "BUNK" SAY SCIENTISTS

Time was when tall, blond, blue-eyed men were considered to be the epitome of all the manly virtues of courage and initiative. To the small dark types, on the contrary, were attributed the less positive qualities of timidity and reticence.

Modern science, however, now comes along and demolishes this pleasant theory, that is, pleasant for the blonds. Psychologists have turned the battery of inquiry on the precepts and principles of professional character readers and pronounce the whole matter of character analysis based on physical traits as having no foundation on scientific fact. In other words, it is all bunk.

Prof. G. C. Brandenburg of the department of psychology of Purdue University, Indiana, has collected the results of these investigations of the self-styled character experts in a report in a recent issue of Industrial Psychology. Prominent in his account is a resume of a tryout of the so-called color law evolved by a very well-known worker in this fertile field. The law states that blonds possess the dynamic traits that make the world's leaders, pioneers, and explorers, while the brunettes have the negative conservative and thoughtful qualities that make writers, research workers and investigators.

Over ninety disinterested persons were each asked to give character ratings of two blonds and two brunettes of his acquaintance. Examination of the details in the character ratings failed to show any constant differences between the two types on the basis of either their blondishness or brunetescence. "Blonds were found to possess brunette traits to the same extent as the brunettes and vice versa", declared the investigators.

Prof. H. D. Kitson of Columbia and G. L. Donham of Indiana University undertook to check up the contention, stoutly upheld by many character readers, that weight and size are necessary assets in salesmanship. Some two hundred salesmen were examined and their respective sizes and weights compared with their selling records. On completion of the test, it was found that the best salesmen were not on the average the tallest nor the heaviest, but the men of medium size averaging around five feet nine inches with proportionate weight.

Even the significance of the profile, long a favorite character guide with almost everybody, is not allowed to go unassailed. No longer is the convex type

with the prominent forehead and square jaw to be associated exclusively with the strong silent man of initiative and power nor the concave type with the more or less receding chin to be thought of only in connection with the patient, docile underling. Examination of a hundred students, checking up the judgment of their intimates with their college records, shows that there was only a preponderance of two per cent. of the boys with the convex type of profile who displayed marked qualities of leadership.

In commenting on the researches of his colleagues, Prof. Brandenburg declares that "in the light of critical studies on the question we must conclude that as a method of character analysis the physiognomic system is wholly devoid of any scientific basis."

TABLOID BOOK REVIEW

THE REPRESSION OF CRIME. By Harry Elmer Barnes. New York. George H. Doran Co. 1926. 382 pages.

Here is an unusually satisfactory survey of that important phase of life in America, the great crime wave. Dr. Barnes devotes a considerable part of his book to looking systematically backward at crime in America from Colonial days, and he presents the inevitable conclusion that getting even with the law breaker has never worked. Vengeance taken by the state has never reformed criminals nor deterred other persons from breaking the law. At present, he declares, our legal system has not caught up to modern biology , psychology, and social science. Much scientific knowledge is available, but the legal machinery is still founded entirely on medieval metaphysical and theological presuppositions.

As for the future, the method of dealing with crime advocated by the author is to regard the criminal as a patient to be given the sort oftreatment and rehabilitation that will make an honest citizen of him. If this is impossible, he should never be released to menace society again. "The guilt of the accused is far less important than the matter of his potential danger to society," Dr. Barnes holds.

The account is brought very much up-to-date by a critical chapter on recent literature on crime and prisons, Usefulness as a reference book is increased by the listing of "selected references" at the end of each chapter.

THE ORIGIN, NATURE AND INFLUENCE OF RELATIVITY; by George David Birkhoff. New York, The Macmillan Company, 1925. 185 pp.

. This book is based on a course of lectures which the author gave in Boston in 1923, and which he repeated in Los Angeles a year later. Now it has been revised and published in a permanent form. Leading up from the Euclidean geometry, he discusses the nature of space and time and then relativity itself, concluding with its philosophic aspects. Though he does not refrain from using occasional mathematical expressions, the non-mathematically trained reader will find much in it of interest that is comprehensible to him.
